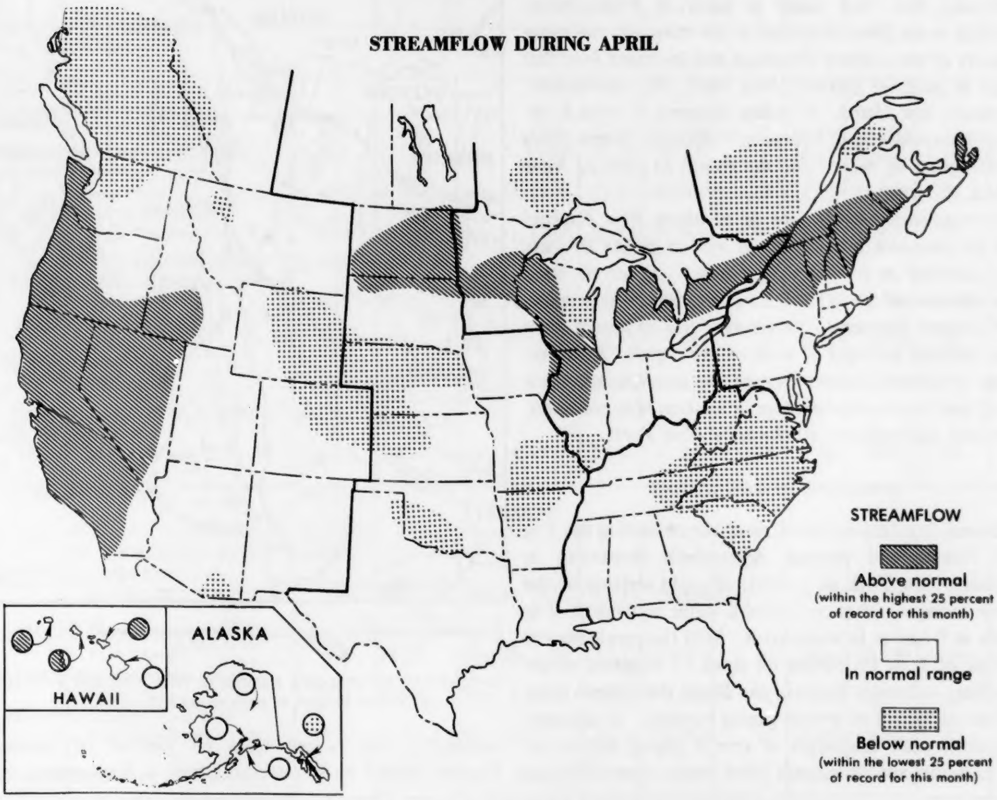
WATER RESOURCES REVIEW for

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANADA
DEPARTMENT OF THE ENVIRONMENT
WATER RESOURCES BRANCH

APRIL 1982

STREAMFLOW DURING APRIL



STREAMFLOW AND GROUND-WATER CONDITIONS

Severe flooding occurred in northern parts of New York and Vermont as a result of the rapid melting of the snowpack that contained a water equivalent of as much as 9 inches in some areas. Peak discharges on several streams in the area were at or close to the highest of record. (See pages 2 and 3 for more-detailed information.) Flooding also occurred in parts of Florida, New Hampshire, and Michigan.

Streamflow generally increased in southern Canada, northern and western parts of the conterminous United States, and in parts of the Gulf Coast States. Flows generally decreased elsewhere in the Southeast Region and in the southern States of the other regions.

Monthly mean discharges remained in the above-normal range in parts of California, Hawaii, Idaho, Illinois, Minnesota, Nevada, North Dakota, and Nova Scotia, and were highest of record for April in parts of California and Nova Scotia.

Below-normal streamflow persisted in parts of Ontario, Quebec, Alaska, Arizona, Colorado, Nebraska, North and South Carolina, and Wyoming, and was lowest of record for the month in parts of Colorado.

Ground-water levels in the Northeast Region rose in northern New England and northeastern New York, as well as in the tri-State area centered on northern New Jersey. Levels declined in south-central New York, southwestern Pennsylvania, and western Maryland. Levels near end of month were near seasonal averages in most of the region. However, levels remained below average in southeastern New York, and were above average in western Massachusetts, Vermont, and adjacent northeastern New York. In the Southeast Region, levels rose in Alabama and Florida, and mostly rose or held steady in Mississippi and Georgia; trends were mixed elsewhere in the region. Levels were above average in Alabama, mostly above average in Kentucky, and mostly below average in Florida; they were above and below average elsewhere. In the Western Great Lakes Region, levels rose in Wisconsin and Michigan, and in most areas in Minnesota. Levels were near or above average in Indiana, and above and below average in Ohio. In the Midcontinent Region, levels rose in North Dakota, declined in Iowa, and declined in most wells in Kansas and Texas; trends were mixed in Nebraska, Arkansas, and Louisiana. Levels were mostly above average in Nebraska and Iowa, below average in Arkansas, and mixed with respect to average elsewhere in the region. In the West, water levels rose in Washington, declined in Montana and New Mexico, and mostly declined in Idaho. Trends were mixed elsewhere in the region. Levels were above average in Washington, below average in Arizona, and mostly below average in Idaho and Utah; they were above and below average elsewhere.

A high ground-water level for the month, set in Nevada in April 1979, was reached again. New low levels for April were recorded in Arizona, Arkansas, Idaho, Kansas, Ohio, Tennessee, and Texas; a low level for April, set in 1980, was reached again in Idaho. New alltime lows occurred in Arizona and Idaho.

NORTHEAST

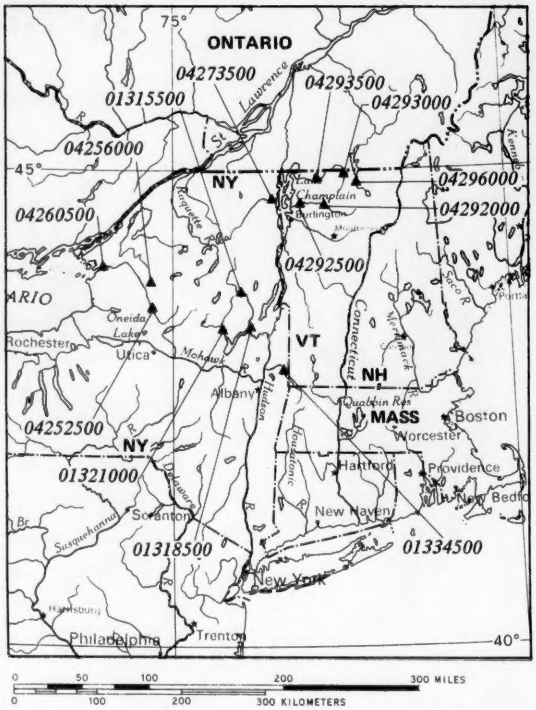
[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

Streamflow decreased in Pennsylvania and in most of Maryland, and increased elsewhere in the region. Below-normal streamflow persisted in parts of Quebec and decreased into that range in parts of Pennsylvania. Monthly mean flows remained in the above-normal range in parts of the Atlantic Provinces and increased into that range in parts of Quebec, New York, New Hampshire, Vermont, and Maine. Flooding occurred in New York, New Hampshire and Vermont. Monthly mean flows were highest of record for the month in parts of Nova Scotia.

Ground-water levels rose in northern New England and northeastern New York, as well as in the tri-State area centered on northern New Jersey. Levels declined in south-central New York, southwestern Pennsylvania, and western Maryland. Levels near end of month were near seasonal averages in most of the region. However, levels remained below average in southeastern New York, and were above average in western Massachusetts, Vermont, and adjacent northeastern New York.

STREAMFLOW CONDITIONS

Severe flooding occurred on streams draining the Tug Hill Plateau and western Adirondack Mountains in northern New York as a result of rapid melting of the heavy snowpack that contained a water equivalent of as much as 9 inches in some areas. Mild temperatures and rainfall of 1 to 1½ inches on April 17 triggered severe flooding, and peak flows in the Black River basin were highest of record at several gaging stations. In adjacent Vermont, peak discharges at several gaging stations in the Lamoille and Missisquoi River basins were also near or slightly greater than those for the period of record. Selected data on stages, discharges, recurrence intervals, and gaging station locations in New York and Vermont are given in the accompanying map and table. Monthly mean flows at all index stations in New York increased



Location of stream-gaging stations in New York and Vermont, described in table of peak stages and discharges.

seasonally and ranged from 67 percent of median (normal range) at Massapequa Creek at Massapequa, on

CONTENTS

Provisional data; subject to revision

STAGES AND DISCHARGES FOR THE FLOODS OF APRIL 1982 AT SELECTED SITES IN NEW YORK AND VERMONT

WRD station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known			Maximum during present flood				
				Date	Stage (feet)	Discharge (cfs)	Date	Stage (feet)	Discharge		Recurrence interval (years)
									Cfs	Cfs per square mile	
	NEW YORK										
	HUDSON RIVER BASIN										
01315500	Hudson River at North Creek..........	792	1907–	Dec. 31, 1948	12.14	28,900	Apr. 18	10.21	18,300	23	10
01318500	Hudson River at Hadley...	1,664	1921–	Jan. 1, 1949	21.21	42,700	18	14.67	26,600	16	5
01321000	Sacandaga River near Hope...........	491	1911–	Mar. 27, 1913	11.0	32,000	18	8.07	15,600	32	3
01334500	Hoosic River near Eagle Bridge..........	510	1910–	Dec. 31, 1948	21.15	55,400	18	11.75	15,200	30	5
	STREAMS TRIBUTARY TO LAKE ONTARIO										
04252500	Black River near Boonville............	295	1911–	Mar. 28, 1913	12.5	12,400	Apr. 18	11.38	14,000	47	>100
04256000	Independence River at Donnattsburg.......	91.7	1942–	May 20, 1969	8.72	3,450	18	9.76	5,750	63	>100
04260500	Black River at Watertown...........	1,876	1920–	Mar. 16, 1977	12.98	39,600	19	11.70	36,000	19	50
	ST. LAWRENCE RIVER BASIN										
04273500	Saranac River at Plattsburg.........	608	1903–30, 1943–	Apr. 8, 1928	12.8	11,500	Apr. 18	9.76	9,800	16	50
	VERMONT										
	ST. LAWRENCE RIVER BASIN										
04292000	Lamoille River at Johnson...........	310	1910–13, 1928–	July 1, 1973	17.33	14,400	Apr. 18	15.07	10,800	35	15
04292500	Lamoille River at East Georgia.........	686	1929–	Mar. 19, 1936	[1]12.52	23,200	18	12.30	23,200	34	50
04293000	Missisquoi River near North Troy..........	131	1931–	May 3, 1940	12.87	7,980	18	13.21	8,500	65	>100
04293500	Missisquoi River near East Berkshire........	479	1911–23, 1927–	Nov. 1927	23.10	[2]45,000	18	17.45	25,000	52	>100
04296000	Black River at Coventry...	122	1951–	Apr. 2, 1976	7.91	5,740	18	7.53	3,210	26	10

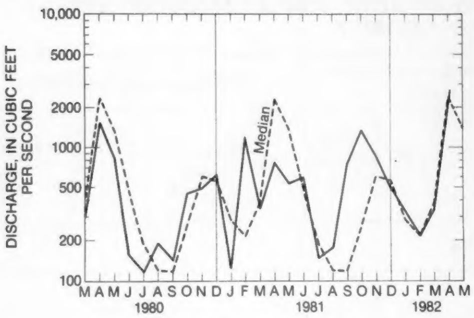
[1] Maximum gage height, 21.64 feet on March 6, 1979; ice jam.
[2] Maximum discharge since at least 1830.

Long Island, to 134 percent of median (above-normal range) at Mohawk River at Cohoes.

In central Vermont, monthly mean discharge of Dog River at Northfield Falls increased sharply as a result of runoff from the rapid snowmelt at midmonth, and flow at that site was above the normal range for the first time since October 1981. Similarly, in adjacent New Hampshire, monthly mean flow of Pemigewasset River at Plymouth increased seasonally to over 7 times the March 1982 mean flow and was above the normal range at 140 percent of median.

In central and southern Maine, mean flows of Piscataquis River near Dover-Foxcroft and Little Androscoggin River near South Paris increased seasonally, were above the normal range, and were 118 and 116 percent of their respective median flows for April (See graph of Piscataquis River near Dover-Foxcroft on page 4.)

South of the St. Lawrence River in southern Quebec, monthly mean flow of St. Francois River at Hemmings Falls increased sharply to 139 percent of median and was above the normal range for the first time since October 1981. By contrast, except for an index station in northeastern Quebec, monthly mean flows at index stations located elsewhere in Quebec remained in the below-normal range.

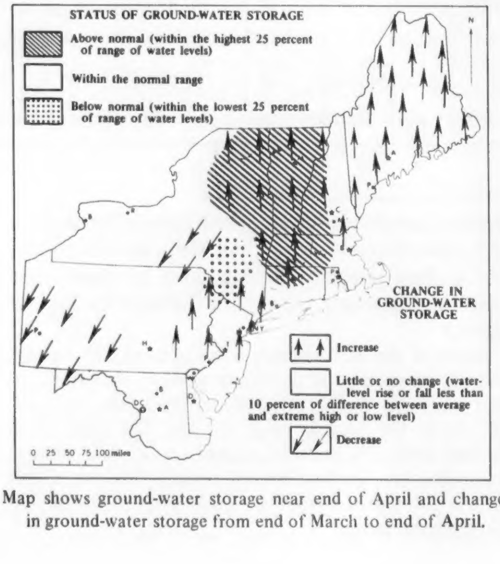


Monthly mean discharge of Piscataquis River near Dover-Foxcroft, Maine (Drainage area, 297 sq mi; 769 sq km)

In northern Nova Scotia, the monthly mean discharge of 2,977 cubic feet per second at Northeast Margaree River at Margaree Valley (drainage area, 142 square miles) was highest for the month in 67 years of record. In southern New Brunswick, mean flow of Lepreau River at Lepreau increased sharply to 167 percent of median and was above the normal range for the first time since September 1981. Mean flows elsewhere in the Atlantic Provinces were near or slightly below median.

In western Pennsylvania, monthly mean flows of Allegheny River at Natrona and Monongahela River at Braddock decreased sharply and were below the normal range for the first time in 12 and 13 months at the respective sites.

In the southeastern part of the region, mean flows at index stations generally increased, except in Pennsylvania and Delaware, and were near the median flows for April.



Map shows ground-water storage near end of April and change in ground-water storage from end of March to end of April.

GROUND-WATER CONDITIONS

Ground-water levels rose in northern New England and adjacent eastern New York as well as in parts of central and southern New England. (See map.) Levels continued to rise in northern New Jersey and adjacent parts of New York and Pennsylvania. Levels declined in south-central New York, southwestern Pennsylvania, and western Maryland. Levels near end of month were near seasonal averages in most of the region. However, levels remained below average in southeastern New York. These low levels contrasted with above-average levels in Vermont, northeastern New York, and western Massachusetts.

SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

Streamflow generally decreased seasonally in Kentucky, North Carolina, South Carolina, Virginia, and West Virginia, increased in Mississippi, and was variable elsewhere in the region. Below-normal streamflow persisted in parts of North Carolina and South Carolina and decreased into that range in parts of Tennessee, Virginia, and West Virginia. Flooding occurred in Florida.

Ground-water levels rose in Alabama and Florida, and mostly rose or held steady in Mississippi and Georgia; trends were mixed elsewhere in the region. Levels were above average in Alabama, mostly above average in Kentucky, and mostly below average in Florida; levels were above and below average elsewhere.

STREAMFLOW CONDITIONS

In Virginia, monthly mean flows decreased seasonally at all index stations and ranged from 48 percent of median at Nottaway River near Stony Creek to 85 percent of median at Rapidan River near Culpeper. Flows declined steadily throughout the month until the last week when heavy statewide rains doubled the flow in many streams. A weighted average of streamflows for the State during April was 63 percent of median and below normal, but considerably higher than last year when flows averaged 43 percent of median.

In southeastern West Virginia, mean flow of Greenbrier River near Alderson decreased seasonally, was only 66 percent of median, and was below the normal range for the first time since March 1981. Farther downstream in the Kanawha River basin, mean discharge of Kanawha River at Kanawha Falls decreased to only 56 percent of median and was also below the normal range.

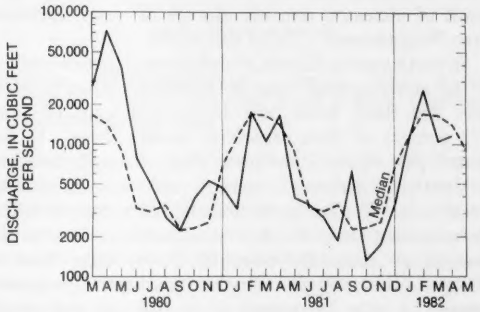
In North Carolina, streamflow remained in the below-normal range in the mountains and western Piedmont, decreased into that range in the Coastal Plain, and was near the median flow in the eastern Piedmont. For

example, in the western part of the State, monthly mean flow of French Broad River at Asheville decreased seasonally, was only 69 percent of median, and remained in the below-normal range for the 2d consecutive month.

In northeastern South Carolina, monthly mean flow of Pee Dee River at Peedee decreased sharply to only 53 percent of median and was below the normal range for the first time since October 1981. In the southwestern part of the State, mean flow of North Fork Edisto River at Orangeburg decreased seasonally and remained in the below-normal range for the 2d consecutive month. Flows were in the normal range elsewhere in the State.

In eastern Tennessee, monthly mean discharges of Emory River at Oakdale and French Broad River below Douglas Dam decreased seasonally, were about ½ their respective median flows for April, and were below the normal range.

In southeastern Mississippi, monthly mean discharge of Pascagoula River at Merrill increased, contrary to the normal seasonal pattern of decreasing flow, was 81 percent of median, and was in the normal range. (See graph.) Mean flow at that site was typical of the normal



Monthly mean discharge of Pascagoula River at Merrill, Miss. (Drainage area, 6,590 sq mi; 17,068 sq km)

trend in streamflow in the western and southern parts of the Southeast Region during April.

In central Florida, monthly mean flow of St. Johns River at Christmas increased sharply to 166 percent of median and was in the normal range, following 21 consecutive months of flow in the below-normal range. Runoff from localized storms caused moderate flooding in Ocala in north-central Florida and in West Palm Beach and Homestead in south Florida. Inflow to Lake Okeechobee increased as a result of the storms but remained near a record low elevation for the month of April.

GROUND-WATER CONDITIONS

Ground-water levels in West Virginia generally declined but rose in some eastern and western counties. Levels were above average in Monongalia, Gilmer, and Wayne Counties but were below average elsewhere.

In Kentucky, water levels rose slightly except in areas of heavy pumping, and were generally above average statewide.

In Virginia, levels in observation wells in the northern and central Piedmont rose 1½ to 2 feet while the level in the well in the southern Piedmont declined nearly a foot. While the levels in the Fairfax and Louisa County wells have continued below average for the last 18 and 20 months, respectively, the level in the well at Matoaka Manor at Colonial Heights was above average for the second consecutive month.

In western Tennessee, the level in the key well in the "500-foot" sand aquifer near Memphis rose a third of a foot, but nevertheless was at a new April low.

In North Carolina, levels declined in the western Piedmont and in the Coastal Plain but continued about a foot above average. Levels rose in the mountains and in the eastern Piedmont but continued 1 to 1½ feet below average.

In Mississippi, levels rose in most of the observation wells. Those in the shallow water-table aquifers rose more than a foot in response to general rainfall. Levels in deeper artesian aquifers statewide recovered less than a foot, except for a few areas influenced by pumping, where there were slight declines. In the Jackson metropolitan area, levels in the Sparta Sand rose about a foot, while levels in the shallower Cockfield Formation held steady.

In Alabama, levels continued to rise; the level in the well at Montgomery County rose 2½ feet and was only 0.1 foot below the record high level for April set in 1968.

In Georgia, levels in the Piedmont rose ½ to 1 foot. In the Savannah area on the coast, levels in the principal artesian aquifer near the center of pumping rose 2.5 to 4.5 feet. In outlying areas, levels rose 0.5 to 1.5 feet. In Bryan and Liberty Counties, levels rose about a foot. Levels near the center of pumping in the Brunswick area declined as much as 2 feet. In outlying areas, levels held fairly steady. In the southwest, levels in the principal artesian aquifer rose as much as 2 feet.

In Florida, water levels in the principal aquifer, the Floridan, generally rose but continued below the median and were normal to below normal for April. Levels in the Biscayne aquifer of south Florida rose as much as 3 feet in response to higher levels in the canals and Conservation Areas and infiltration from flooding. Levels in the sand and gravel of west Florida rose but continued below normal.

WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

Streamflow generally increased seasonally in Ontario, Minnesota, and Wisconsin, decreased seasonally in

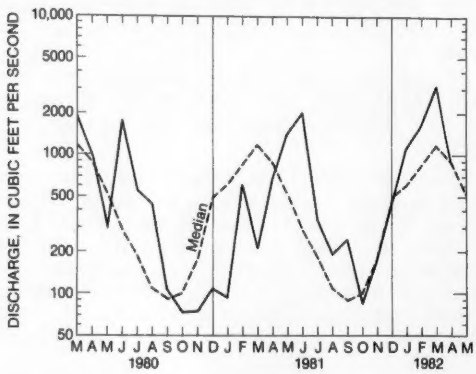
Indiana and Ohio, and was variable elsewhere in the region. Monthly mean flows remained in the above-normal range in parts of Illinois and Minnesota, and increased into that range in parts of Michigan, Ontario, and Wisconsin. Below-normal streamflow persisted in parts of Ontario. Flooding occurred in Michigan.

Ground-water levels rose in Wisconsin and Michigan, and in most areas in Minnesota. Levels were near or above average in Indiana, and above and below average in Minnesota and Michigan. They were near or below average in Ohio. A new low level for April was recorded in Ohio.

STREAMFLOW CONDITIONS

In northeastern Ohio, monthly mean discharge of Little Beaver Creek near East Liverpool decreased sharply to ½ the median flow for April and was below the normal range for the first time since March 1981. Contents of reservoirs in the Mahoning River basin upstream from Newton Falls and in the Scioto River basin upstream from Higby were 63 and 102 percent of their respective normal capacities.

In northeastern Indiana, where monthly mean discharge in March of Mississinewa River at Marion was highest of record for the month, flow decreased sharply in April and was near the median flow. (See graph.)



Monthly mean discharge of Mississinewa River at Marion, Ind. (Drainage area, 682 sq mi; 1,766 sq km)

Flow at that site was typical of the normal trend in streamflow elsewhere in Indiana and in southern Michigan and western Ohio.

In the northern part of Michigan's Lower Peninsula, monthly mean flow of Muskegon River at Evart (drainage area, 1,450 square miles) increased sharply into the above-normal range and the mean discharge of 3,274 cubic feet per second (cfs) was the 7th highest for April in 50 years of record. In the Upper Peninsula, the peak discharge of 7,800 cfs on April 17 at South Branch Ontonagon River at Ewen (drainage area, 348 square miles) was second highest in 44 years of record and had a recurrence interval of less than 25 years. There was no significant flooding elsewhere in the basin.

In southeastern Ontario, mean flow of Saugeen River near Port Elgin increased seasonally to 137 percent of median and was above the normal range for the first time since October 1981. By contrast, in western Ontario, mean flow of English River at Umfreville increased seasonally but was less than ½ the April median flow and remained in the below-normal range for the 15th time in the past 16 months.

In Minnesota, streamflow was above the normal range in a band across the central part of the State that included the Crow River basin, the upper Minnesota River basin, and part of the Mississippi River basin upstream from Anoka. Flows elsewhere in the State were generally above median but within the normal range.

In Wisconsin, streamflow increased seasonally and was above the normal range at Chippewa River at Chippewa Falls, Jump River at Sheldon, and Wisconsin River at Muscoda as a result of snowmelt runoff coupled with moderate amounts of precipitation. By contrast, in eastern Wisconsin, mean flow of Fox River near Wrightstown decreased and was below the normal range as a result of increased reservoir storage of water upstream from Wrightstown.

In northwestern Illinois, monthly mean flows remained in the above-normal range at Pecatonica River at Freeport and Rock River near Joslin, and were 179 and 173 percent of their respective median flows. In the central part of the State, mean flow of Sangamon River at Monticello decreased, contrary to the normal seasonal trend, was 158 percent of median, and remained in the above-normal range for the 3d consecutive month. In contrast to these above-normal flows, mean flow of Skillet Fork at Wayne City, in southern Illinois, decreased to only 28 percent of median and was in the below-normal range for the first time since April 1981.

GROUND-WATER CONDITIONS

In Minnesota, ground-water levels in shallow water-table wells generally rose statewide. The level in the index well at Hanska in south-central Minnesota rose; it was above average for the 9th consecutive month. In the east-central and southwestern parts of the State, levels rose ½ foot to more than a foot and continued at or near average. The level in the index well at Camp Ripley in central Minnesota rose, but continued below average. Water levels in surficial aquifers in the northern part of the State rose and were average to slightly above average except in the Red River Valley, where they were 1½ feet below average. In the Minneapolis-St. Paul area, artesian levels in wells tapping the Prairie du Chien-Jordan aquifer rose in St. Paul and declined in Minneapolis; they were 4 to 11 feet above average. Levels in the deeper Mount Simon-Hinckley aquifer rose in Minneapolis and declined

slightly in St. Paul; they were ½ to 8 feet above average. In east-central Minnesota, levels in wells in the Mount Simon Sandstone rose a foot or more and were at or near average. The artesian level in a buried glacial sand well at Mora, also in east-central Minnesota, rose 3 feet but was still 3 feet below average. In the southeast, water levels in bedrock aquifers rose several feet and were 1 to 5 feet above average.

In Wisconsin, water levels generally rose in most parts of the State. Levels in the key observation wells rose 1 to 3 feet.

In Michigan, levels rose in most areas. Levels were above average in parts of the northern Lower Peninsula but were below average elsewhere.

In northwestern Illinois, the level in the water-table well in glacial drift at Princeton, in Bureau County, rose 1½ feet and continued above average by 2½ feet.

In Indiana, water levels declined during the month to average levels except in the northeastern part of the State, where levels continued at near-record highs for April.

In Ohio, water levels declined considerably and were normal in the northeastern part of the State. The level in the key well in central Ohio was at a record low for April.

MIDCONTINENT

[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

Streamflow decreased in Iowa, Kansas, Oklahoma, and Nebraska, increased seasonally in North Dakota and Saskatchewan, and was variable elsewhere in the region. Monthly mean flows were in the below-normal range in Nebraska, Oklahoma, and parts of Arkansas, Kansas, and Missouri. Flows were in the above-normal range in North Dakota.

Ground-water levels rose in North Dakota, declined in Iowa, and declined in most wells in Kansas and Texas; trends were mixed in Nebraska, Arkansas, and Louisiana. Levels were mostly above average in Nebraska and Iowa, below average in Arkansas, and mixed with respect to average elsewhere in the region. New April low levels were reached in Kansas, Arkansas, and Texas.

STREAMFLOW CONDITIONS

In southern Saskatchewan, monthly mean flow of Qu'Appelle River near Lumsden increased seasonally and was in the normal range following 2 consecutive months of flow in the below-normal range.

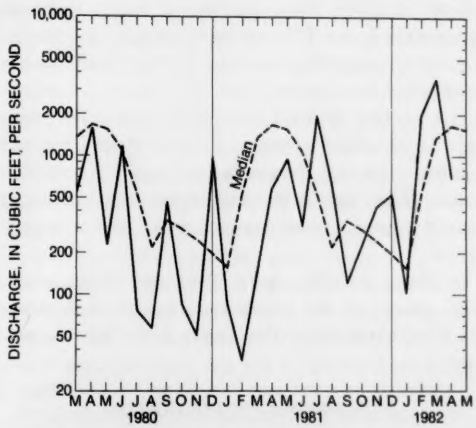
In eastern North Dakota, mean discharge of Red River of the North at Grand Forks increased seasonally to twice the median flow and was in the above-normal range. In the southwestern part of the State, mean flow of Cannonball River at Breien also increased seasonally, was almost 15 times median, and was in the above-normal range for the 3d consecutive month.

In central South Dakota, monthly mean flow of Bad River near Fort Pierre increased seasonally to 28 percent of median and remained in the normal range. In the eastern part of the State, mean flow of Big Sioux River, as measured at Akron, Iowa, decreased seasonally and remained in the normal range.

In northeastern Nebraska, mean discharge of Elkhorn River at Waterloo decreased seasonally to 63 percent of median and was below the normal range. In the northwestern part of the State, mean flow of Niobrara River above Box Butte Reservoir also decreased seasonally, was 67 percent of median, and was in the below-normal range for the 6th consecutive month. Flow in the Republican River basin in the southwestern part of the State was also below the normal range.

In Iowa, streamflow decreased and returned to the normal range. Monthly mean flows of Nishnabotna River above Hamburg, Des Moines River at Fort Dodge, and Cedar River at Cedar Rapids were 131, 159, and 167 percent of median, respectively.

In southern Missouri, monthly mean discharge of Gasconade River at Jerome decreased, was only 35 percent of median for the month, and was below the normal range. In the northwestern part of the State, mean flow of Grand River near Gallatin also decreased, contrary to the normal seasonal trend, and was 43 percent of median but was within the normal range. (See graph.)

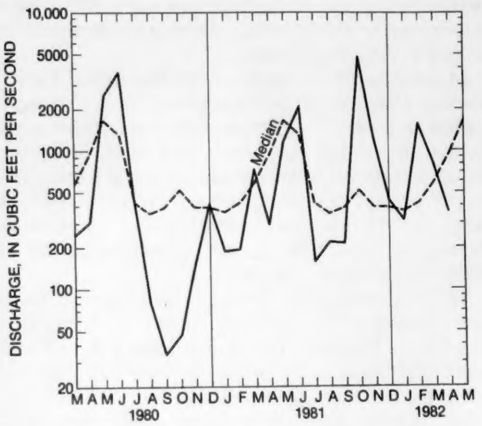


Monthly mean discharge of Grand River near Gallatin, Mo. (Drainage area, 2,250 sq mi; 5,830 sq km)

In northwestern Kansas, monthly mean discharge of Saline River near Russell decreased, contrary to the normal seasonal trend, was only 45 percent of median, and was below the normal range. Elsewhere in the State, flows were in the normal range but less than median at the respective index stations.

In southwestern Oklahoma, monthly mean flow of Washita River near Dickson decreased to only

40 percent of median, and was below the normal range for the first time since July 1981. (See graph.)



Monthly mean discharge of Washita River near Dickson, Okla. (Drainage area, 7,202 sq mi; 18,653 sq km)

Similarly, in northern Arkansas, monthly mean flow of Buffalo River near St. Joe decreased to only 40 percent of median, and was below the normal range for the first time since April 1981. By contrast, in the southern part of the State, mean discharge of Saline River near Rye increased, was 129 percent of median, and returned to normal range after five consecutive months of flow that was less than median.

In Louisiana, monthly mean flows were in the normal range at all index stations. Flow of Pearl River near Bogalusa decreased seasonally and was 62 percent of median. Elsewhere in the State, streamflow increased in contrast to the normal seasonal trend, and was above median.

In Texas, monthly mean flows were in the normal range, except in the panhandle area and in the upper Red River basin, where flows were in the below-normal range.

GROUND-WATER CONDITIONS

Ground-water levels in North Dakota rose more than 3 feet in the key well in the southeast but continued slightly below average. In the southwest, the level in the key well rose 1½ feet and was about a foot above average.

In Nebraska, levels rose in most of the deep wells in the irrigated areas. Levels declined in most of the shallow water-table wells but were above average.

In Iowa, levels in shallow water-table wells generally declined slightly but continued well above average except in the extreme southwestern part of the State, where they were below average.

In Kansas, ground-water levels declined and were below average in the key observation wells in Thomas, Sedgwick, and Harvey Counties. In Douglas County, the level in the key well declined slightly but was about half a foot above average. The level in the well in Thomas County, at the Kansas Agricultural Experiment Station, reached a new April low in 35 years of record.

In Arkansas, the level in the key well in the deep Sparta Sand aquifer rose $2^2/_3$ feet but was 22 feet below average. In the industrial aquifer of central and southern Arkansas—also the Sparta Sand—the level in the key well at Pine Bluff declined 1 foot, reaching a new April low in 24 years of record. At the El Dorado well, the level rose 3½ feet but was nearly 9 feet below average.

In Louisiana, levels in wells in the Chicot aquifer of southwestern Louisiana generally rose. In the Lake Charles industrial area, levels in wells in all sands were higher than at this time last year. Levels in wells in terrace and alluvial aquifers continued seasonal rises in response to precipitation and higher stream stages. Regional declines continued in wells in Miocene aquifers in central Louisiana and in wells in the Sparta Sand in northern Louisiana. In the Baton Rouge area, levels in most observation wells in the "400-foot" and "600-foot" sands continued their rising trend of the past few years. Water levels in most wells in the Gonzales-New Orleans aquifer continued the rising trend of the past several years. In the Florida Parishes, water levels in most observation wells screened in the shallow sands have shown little net change during the past 5 or more years. In the intermediate sands, levels have declined 1 to 4 feet since last spring, and in the deep sands, as much as 5 feet since last spring.

In Texas, ground-water levels in key observation wells were above average in the Edwards aquifer at Austin, but were below average in the Edwards aquifer at San Antonio, in the Evangeline aquifer at Houston, and in the Hueco bolson at El Paso. Water levels rose at Houston, but declined at Austin, San Antonio, and El Paso. The level in the well at El Paso reached a new low for April in 17 years of record.

WEST

[Alberta, and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

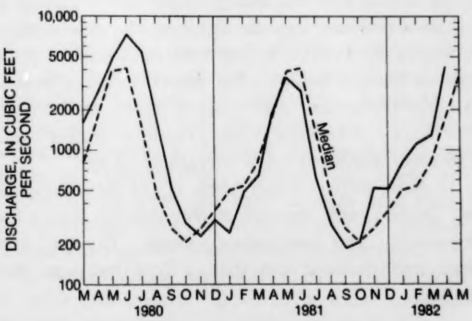
Streamflow increased seasonally in British Columbia, Colorado, Idaho, Montana, Nevada, Utah, and Wyoming, decreased in Alberta, and was variable elsewhere in the region. Monthly mean flows remained in the above normal range in parts of California, Idaho, and Nevada, and increased into that range in parts of Colorado, Oregon,

and Washington. Flows remained in the below-normal range in parts of Arizona, Colorado, and Wyoming, and decreased into that range in parts of Alberta, British Columbia, Montana, and Washington. Monthly and/or daily mean flows were highest of record for the month in parts of California and lowest of record for the month in parts of Colorado.

Ground-water levels rose in Washington, declined in Montana and New Mexico, and mostly declined in Idaho. Trends were mixed elsewhere in the region. Levels were above average in Washington, below average in Arizona, and mostly below average in Idaho and Utah; they were above and below average elsewhere. A high level for April, set in 1979, was reached again in Nevada. New lows for April, and new alltime lows, were recorded in Idaho and Arizona; a low level for April, set in 1980, was reached again in Idaho.

STREAMFLOW CONDITIONS

In California, streamflow generally increased, was above the normal range, and was highest of record for the month in most of the State. Contents of major reservoirs in northern California were 122 percent of average and 108 percent of the contents a year ago. In the southern part of the Sierra Nevada west slope, the monthly mean discharge of 4,013 cfs in Kings River above North Fork near Trimmer (drainage area, 952 square miles) was second highest for the month in 53 years of record, and the daily mean of 19,600 cfs on April 11 was highest of record for April. (See graph.)



Monthly mean discharge of Kings River above North Fork near Trimmer, Calif. (Drainage area, 952 sq mi; 2,466 sq km)

On the central Sierra Nevada east slope, the daily mean flow of 1,180 cfs on April 11, in West Walker River below Little Walker River near Coleville (drainage area, 180 square miles), was highest for the month since records began in April 1938. In northern California, on the Sierra Nevada west slope, the monthly mean flow of 4,480 cfs and the daily mean of 21,500 cfs on April 11 at North Fork American River at North Fork Dam (drainage area, 342 square miles) were highest for April in 72 years of record, and flow at that site remained in the above-normal range for the 3d consecutive month. Downstream, on the main stem of the Sacramento River at Verona, the monthly mean discharge of 64,580 cfs was highest for any month in 53 years of record and mean flows remained in the above-normal range for the 6th consecutive month. Similarly, in north-coastal California, the monthly mean discharge of 11,760 cfs in Smith River near Crescent City (drainage area, 609 square miles) was highest for April in 51 years of record.

In northeastern Nevada, monthly mean discharge in Humboldt River at Palisade continued to increase seasonally and remained in the above-normal range for the 3d consecutive month.

In southwestern Oregon, monthly mean flow in Umpqua River near Elkton continued to increase, contrary to the normal seasonal trend, and was above the normal range at 184 percent of median. In north-coastal Oregon, mean flow of Wilson River near Tillamook decreased seasonally but was in the above-normal range. In the western part of the State, flow at Willamette River at Salem increased to 133 percent of median and was also in the above-normal range.

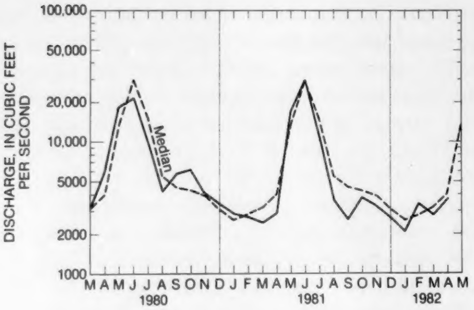
In southwestern Washington, mean flow of Chahalis River near Grand Mound decreased seasonally but was above the normal range for April. By contrast, in northwestern Washington, monthly mean discharge of Skykomish River near Gold Bar decreased, contrary to the normal seasonal trend of increasing flows, and was below the normal range for the first time since November 1981.

In British Columbia, monthly mean flows of Fraser River at Hope and Skeena River at Usk increased seasonally, were below the normal range, and were 58 and 54 percent of their respective median flows.

In western Alberta, where monthly mean flow of Bow River at Banff was above the normal range in February and March, flow decreased in contrast to the normal seasonal trend and was below the normal range in April.

In northwestern Montana, mean flow of Middle Fork Flathead River near West Glacier increased seasonally but was only 60 percent of median and was below the normal range, following 2 consecutive months of flow in the above-normal range. In the southern part of the State, monthly mean discharge of Yellowstone River at Billings increased seasonally but remained below-median for the 2d consecutive month and was within the normal range. (See graph on page 10.) Elsewhere in Montana, mean flows increased seasonally and were also in the normal range.

In northern Wyoming, monthly mean flow of Tongue River near Dayton increased seasonally and remained



Monthly mean discharge of Yellowstone River at Billings, Mont. (Drainage area, 11,795 sq mi; 30,549 sq km)

in the below-normal range for the 2d consecutive month. In the southern part of the State, mean flow of North Platte River above Seminoe Reservoir near Sinclair (drainage area, 8,134 square miles) also increased seasonally but the daily mean flow of 180 cfs on April 10, 11 was lowest for April in 43 years of record.

East of the Continental Divide in central Colorado, the monthly mean flow of 12.8 cfs in Bear Creek at Morrison was lowest for the month in 73 years of record. Mean flow at Morrison increased seasonally but remained in the below-normal range for the 2d consecutive month. Elsewhere in the State, monthly mean flows at index stations increased seasonally, were greater than median, but were within the normal range.

In southern Arizona, monthly mean flow of San Pedro River at Charleston continued to decrease seasonally to 55 percent of median, and remained in the below-normal range for the 6th consecutive month. Elsewhere in Arizona and in southern New Mexico, flows at index stations generally decreased seasonally, were greater than median, but were within the normal range.

In Utah and Idaho, monthly mean flows increased seasonally as a result of snowmelt runoff but flows at all index stations were generally within the normal range. Reservoir storage in Idaho was reduced in anticipation of above-average snowmelt runoff.

Contents of the Colorado River Storage Project increased by 246,235 acre-feet during the month.

GROUND-WATER CONDITIONS

In Washington, the ground-water level in the key well at Spokane, in the eastern part of the State, rose 3 feet and was $2^1/_3$ feet above average. In western Washington, the level in the key well at Tacoma rose less than a foot and continued above average by 5¾ feet.

In Idaho, the level in the key well in the sand and gravel aquifer in the Boise Valley declined seasonally a little over a foot but was a foot above average. Water levels in the key wells representative of the Snake River Plain aquifer reached the same level as the record month-end low of last year near Atomic City. New month-end low water levels were recorded in the Rupert-Minidoka area and near Eden, and were below average near Gooding. The water level in the key well in the alluvium underlying the Rathdrum Prairie in northern Idaho rose and was above average for the first time since 1976.

In Montana, the level in the key well at Missoula declined 1 foot but continued above average. At the Hamilton Fairgrounds, the level in the key well declined more than half a foot and was slightly below average.

In southern California, water levels in the key wells in Los Angeles County and the Upper Cuyama Valley rose, while levels in the Santa Ynez Valley and Santa Maria Valley wells dropped. Water levels were below average in the Los Angeles County and Santa Ynez Valley wells and above average in the Upper Cuyama and Santa Maria Valley index wells.

In Nevada, the level in the key well in Las Vegas Valley declined and was below average. On the other hand, the levels in the key wells in Paradise Valley and in Steptoe Valley rose and were above average.

Water levels in Utah declined and were below average in the Flowell and Holladay areas, rose but were below average in the Logan area, and declined but were above average in the Blanding area.

In Arizona, the level in the City of Tucson No. 2 well declined, reaching a new alltime high in 14 years of record. Despite a net rise of more than 2 feet, the level in the Elfrida well was nearly 35 feet below average and was at a new low level for April in 31 years of record. Again, in the Avra Valley key well, there was a slight net rise—a tenth of a foot—but nevertheless the level was at a new alltime low in 19 years of record. In the well in the Western Salt River Valley, the level declined about 8 feet and continued below average by 27 feet.

In New Mexico, water levels in the Berrendo-Smith and Dayton wells declined 8 feet and less than a foot, respectively, and were below average. The level in the Hrna well declined less than a foot but was above average.

ALASKA

In southeastern Alaska, monthly mean discharge of Gold Creek at Juneau increased seasonally to 32 percent of median, but remained below the normal range. Affected by colder than normal temperatures and by withdrawal from upstream water-supply wells, flow at this station disappeared during the first 10 days in April. Flows at other index stations also reacted to colder than

normal temperatures; however, flows generally increased near the end of April. In interior Alaska, monthly mean flow of Chena River at Fairbanks (drainage area, 1,980 square miles) increased seasonally to 60 percent of median for April but was below the normal range. The mean flow of 219 cfs at this site was the 3d lowest for the month in 35 years of record. Flows at other index stations in the State were in the normal range and near or slightly less than their respective medians.

Ground-water levels continued to decline seasonally by 1 to 3 feet in the confined aquifer system of the Anchorage bowl; however, the decline was as much as 14 feet in the central part of the bowl, reflecting heavy pumping at municipal wells.

HAWAII

Streamflow remained above the normal range, except on the island of Hawaii, where mean flow of Waiakea Stream near Mountain View was near median. At East Branch of North Fork Wailua River near Lihue, Kauai, (drainage area, 6.27 square miles), the mean flow of 138 cfs was the 3d highest for April in 68 years of record. Also, at Honopou Stream near Huelo, Maui, (drainage area, 0.64 square mile), the mean flow of 22.6 cfs was the 3d highest for April in 72 years of record. At Kalihi Stream near Honolulu, Oahu, monthly mean flow was 347 percent of median.

On Guam, Mariana Islands, mean flow of Ylig River near Yona decreased seasonally but remained in the normal range.

METRIC EQUIVALENTS OF UNITS USED IN THE WATER RESOURCES REVIEW

(Round-number conversions, to nearest four significant figures)

1 foot = 0.3048 meter 1 mile = 1.609 kilometers
1 acre = 0.4047 hectare = 4,047 square meters
1 square mile (sq mi) = 259 hectares = 2.59 square kilometers (sq km)
1 acre-foot (ac-ft) = 1,233 cubic meters
1 million cubic feet (mcf) = 28,320 cubic meters
1 cubic foot per second (cfs) = 0.02832 cubic meters per second = 1.699 cubic meters per minute
1 second-foot-day (cfsd) = 2,447 cubic meters
1 million gallons (mg) = 3,785 cubic meters = 3.785 million liters
1 million gallons per day (mgd) = 694.4 gallons per minute (gpm) = 2.629 cubic meters per minute = 3,785 cubic meters per day

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DISSOLVED SOLIDS AND WATER TEMPERATURES FOR APRIL ON SIX LARGE RIVERS

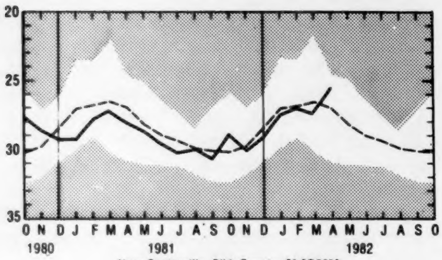
The table on page 13 shows dissolved-solids and temperature data for April at six stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). NASQAN, as established by the U.S. Department of the Interior, Geological Survey, is designed to describe the water quality of the Nation's streams and rivers on a systematic and continuing basis, so as to meet many of the information needs of those involved in national or regional water-quality planning and management.

"Dissolved solids," as described in several columns of the table, are minerals dissolved in water and usually consist predominantly of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. These same minerals are among the most common components of the Earth's solid rocks and minerals, but gradually erode and at least partly dissolve as a part of natural weathering processes. Collectively these and other dissolved minerals constitute the dissolved-solids concentration expressed in milligrams per liter (mg/L) or the generally equivalent expression, parts per million (parts of dissolved matter in one million parts of water, by weight). Values of dissolved solids are convenient for comparing the quality of water from one time to another and from one place to another. Most drinking water contains between 50 and 500 mg/L of dissolved solids.

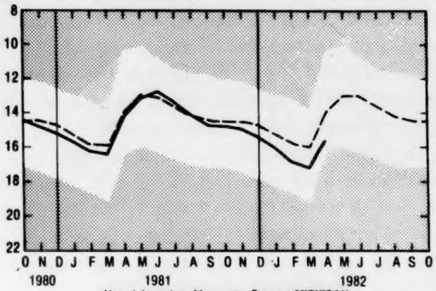
"Dissolved-solids discharge," expressed in tons per day, represents the total daily amount of dissolved minerals carried by the stream and is calculated by multiplying the dissolved-solids concentration (in mg/L) by the stream discharge (in cfs; times a unit conversion factor of 0.0027). Even though dissolved-solids *concentrations* are generally higher during periods of low streamflow than of high streamflow, the highest dissolved-solids *discharges* occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at time of low flow.

MONTH-END GROUND-WATER LEVELS IN KEY WELLS

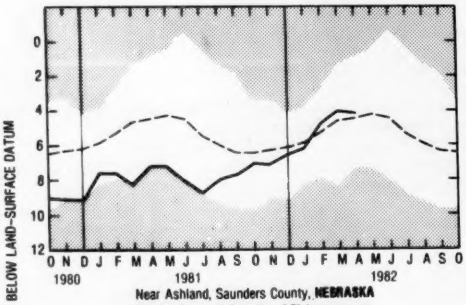
UNSHADED AREA INDICATES RANGE BETWEEN HIGHEST AND LOWEST RECORD FOR THE MONTH
DOTTED LINE INDICATES AVERAGE OF MONTHLY LEVELS, IN PREVIOUS YEARS
HEAVY LINE INDICATES LEVEL FOR CURRENT PERIOD



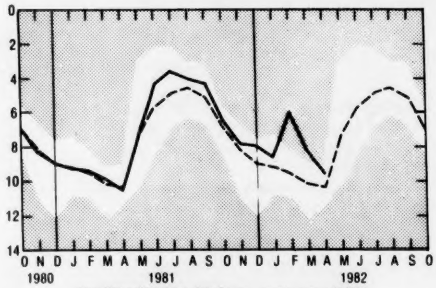
Near Centreville, Bibb County, **ALABAMA**
Copper Ridge and Chepultepec Dolomite
29 years of record, 1952–80



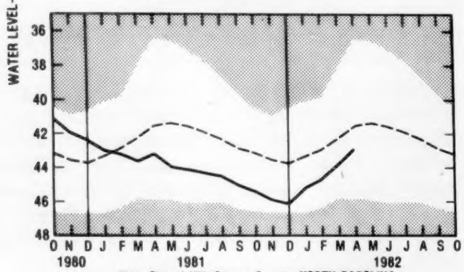
Near Ishpeming, Marquette County, **MICHIGAN**
Sand and gravel of Pleistocene age
20 years of record, 1961–80



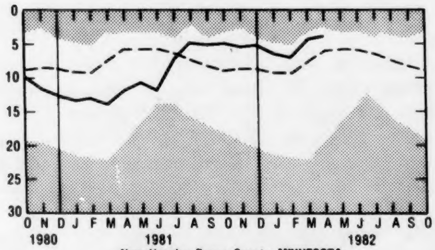
Near Ashland, Saunders County, **NEBRASKA**
Sand and gravel deposits of Pleistocene age
48 years of record, 1933–80



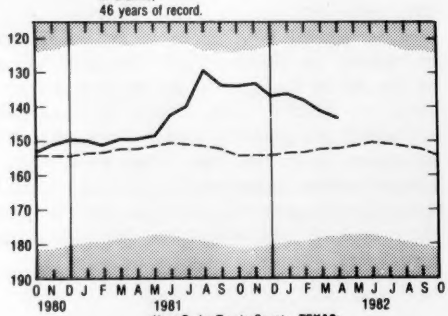
Near Boise (Meridian), Ada County, southwestern **IDAHO**
Quaternary sand and gravel
47 years of record, 1934–80



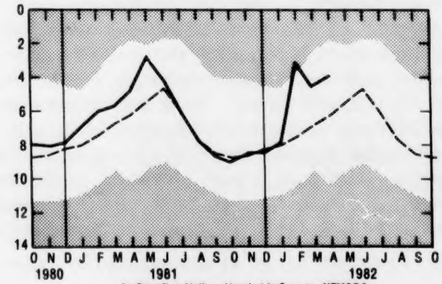
Near Chapel Hill, Orange County, **NORTH CAROLINA;**
in Granite;
46 years of record.



Near Hanska, Brown County, **MINNESOTA;**
in glacial deposits;
39 years of record.



Near Buda, Travis County, **TEXAS;**
in Edwards Limestone;
38 years of record.



At Paradise Valley, Humboldt County, **NEVADA;**
in Quaternary alluvium;
36 years of record.

Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES FOR APRIL AT DOWNSTREAM SITES ON SIX LARGE RIVERS

Station number	Station name	April data of following calendar years	Stream discharge during month	Dissolved-solids concentration during month[a]		Dissolved-solids discharge during month[a] (tons per day)			Water temperature during month[b]		
			Mean (cfs)	Minimum (mg/L)	Maximum (mg/L)	Mean	Minimum	Maximum	Mean, in °C	Mini-mum, in °C	Maxi-mum, in °C
	NORTHEAST										
01463500	Delaware River at	1982	24,933	68	87	5,277	3,362	9,543	9.0	3.0	14.0
	Trenton, N.J.	1945–81	21,550	46	124	......	1,240	12,300	.....	3.0	22.5
	(Morrisville, Pa.)	(Extreme yr)		(1962)	(1981)		(1966)	(1960)			
			c23,320								
04264331	St. Lawrence River at	1982	274,000	165	166	122,000	107,000	136,000	2.5	0.5	5.0
	Cornwall, Ontario, near	1976–81	282,800	164	168	127,000	111,000	146,000	4.0	0.5	6.5
	Massena, N.Y.	(Extreme yr)		(1977)	(1976)		(1981)	(1976)			
	median streamflow at		c265,700								
	Ogdensburg, N.Y.										
	SOUTHEAST										
07289000	Mississippi River at	1982	1,004,000	193	223	532,000	406,000	635,000	13.5	12.0	17.0
	Vicksburg, Miss.	1976–81	977,900	155	250	530,000	180,000	1,030,000	15.0	7.0	20.0
		(Extreme yr)		(1977)	(1981)		(1981)	(1979)			
			c930,400								
	WESTERN GREAT LAKES REGION										
03612500	Ohio River at lock and dam	1982	377,000	168	199	......	153,000	296,000	.....	10.5	15.0
	53, near Grand Chain, Ill.	1955–81	440,300	117	282	......	22,400	462,000	.....	6.5	19.0
	(25 miles west of Paducah,	(Extreme yr)		(1957)	(1969)		(1976)	(1975)			
	Ky.; streamflow station		c480,500								
	at Metropolis, Ill.)										
	MIDCONTINENT										
06934500	Missouri River at Hermann,	1982	73,100	324	445	76,500	62,100	104,000	13.5	8.5	17.0
	Mo. (60 miles west of St.	1976–81	109,200	157	504	186,000	41,400	168,000	14.0	6.0	22.5
	Louis, Mo.)	(Extreme yr)		(1979)	(1981)		(1977)	(1978)			
			c88,120								
	WEST										
14128910	Columbia River at	1982	273,000	94	106	73,100	45,800	92,700	8.0	7.0	10.0
	Warrendale, Oreg.	1976–81	176,200	85	127	50,900	22,300	90,500	9.0	7.0	12.5
	(streamflow station	(Extreme yr)		(1976)	(1977)		(1977)	(1976)			
	at The Dalles, Oreg.)		c220,700								

[a]Dissolved-solids concentrations when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: [(1.8 X °C) + 32] = °F.
[c]Median of monthly values for 30-year reference period, water years 1951–80, for comparison with data for current month.

SELECTED DATA FOR THE GREAT LAKES, GREAT SALT LAKE, AND OTHER HYDROLOGIC SITES

GREAT LAKES LEVELS

Water levels are expressed as elevations in feet above International Great Lakes Datum 1955

(Data furnished by National Ocean Survey, NOAA, via U.S. Army Corps of Engineers office in Detroit. To convert data to elevations in feet above National Geodetic Vertical Datum of 1929 (NGVD), formerly called sea level datum of 1929, add the following values: Superior, 0.96; Michigan-Huron, 1.20; St. Clair, 1.24; Erie, 1.57; Ontario, 1.22.)

Lake	April 30, 1982	Monthly mean, April		April		
		1982	1981	Average 1900–75	Maximum (year)	Minimum (year)
Superior (Marquette, Mich.)	600.00	599.80	600.29	600.03	601.14 (1951)	598.23 (1926)
Michigan and Huron (Harbor Beach, Mich.)	578.68	578.53	578.88	577.99	580.32 (1973)	575.36 (1964)
St. Clair (St. Clair Shores, Mich.)	574.85	574.84	574.38	573.28	575.91 (1973)	571.09 (1901)
Erie (Cleveland, Ohio)	572.45	572.40	571.50	570.51	573.30 (1973)	568.20 (1934)
Ontario (Oswego, N.Y.)	245.63	245.25	244.70	245.01	247.69 (1973)	242.38 (1935)

LAKE WINNIPEG AT GIMLI, MANITOBA

Alltime high: 718.26 (July 1974). Alltime low: 709.62 (February 1941).	Monthly mean, April				
	1982	1981	Average 1913–81	Maximum (year)	Minimum (year)
Elevation in feet above NGVD:	712.96	712.53	713.14	716.38 (1975)	709.94 (1941)

GREAT SALT LAKE

Alltime high: 4,211.6 (1873). Alltime low: 4,191.35 (October 1963).	April 30, 1982	April 30, 1981	April		
			Average, 1904–81	Maximum (year)	Minimum (year)
Elevation in feet above NGVD:	4,200.40	4,200.75	4,199.01	4,205.10 (1924)	4,192.75 (1963)

LAKE CHAMPLAIN, AT ROUSES POINT, N.Y.

Alltime high (1827–1981): 102.1 (1869). Alltime low (1939–1981): 92.17 (1941).	April 29, 1982	April 29, 1981	April		
			Average, 1939–78	Max. daily (year)	Min. daily (year)
Elevation in feet above NGVD:	101.15	97.42	98.26	101.51 (1976)	94.11 (1965)

FLORIDA

Site	April 1982		March 1982	April 1981
	Discharge in cfs	Percent of normal	Discharge in cfs	Discharge in cfs
Silver Springs near Ocala (northern Florida)	700	92	650	710
Miami Canal at Miami (southeastern Florida)	50	125	0	0
Tamiami Canal outlets, 40-mile bend to Monroe	4	270	1.0	1.0

Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF APRIL 1982

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	Percent of normal maximum				Normal maximum (acre-feet)[a]
	End of Apr. 1982	End of Apr. 1981	Average for end of Apr.	End of Mar. 1982	
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	80	83	77	77	[b]226,300
QUEBEC					
Allard (P)	92	92	80	29	280,600
Gouin (P)	34	84	51	39	6,954,000
MAINE					
Seven reservoir systems (MP)	78	82	67	36	4,098,000
NEW HAMPSHIRE					
First Connecticut Lake (P)	53	75	50	15	76,450
Lake Francis (FPR)	62	75	54	16	99,310
Lake Winnipesaukee (PR)	100	100	97	62	165,700
VERMONT					
Harriman (P)	97	49	77	25	116,200
Somerset (P)	78	88	74	45	57,390
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	93	88	89	81	77,920
NEW YORK					
Great Sacandaga Lake (FPR)	99	97	91	29	786,700
Indian Lake (FMP)	88	84	91	42	103,300
New York City reservoir system (MW)	100	70	.....	85	1,680,000
NEW JERSEY					
Wanaque (M)	101	76	93	94	85,100
PENNSYLVANIA					
Allegheny (FPR)	42	45	45	34	1,180,000
Pymatuning (FMR)	98	45	103	106	188,000
Raystown Lake (FR)	68	98	56	68	761,900
Lake Wallenpaupack (PR)	84	57	79	86	157,800
MARYLAND					
Baltimore municipal system (M)	78	81	94	76	255,800
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	91	88	93	84	288,800
Narrows (Badin Lake) (P)	97	88	101	94	128,900
High Rock Lake (P)	83	69	84	67	234,800
SOUTH CAROLINA					
Lake Murray (P)	94	89	82	87	1,614,000
Lakes Marion and Moultrie (P)	86	96	81	85	1,862,000
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	83	60	75	82	1,730,000
GEORGIA					
Burton (PR)	95	95	92	84	104,000
Sinclair (MPR)	98	89	91	82	214,000
Lake Sidney Lanier (FMPR)	60	53	64	56	1,686,000
ALABAMA					
Lake Martin (P)	100	94	95	85	1,373,000
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	55	46	62	54	2,229,300
Douglas Lake (FPR)	49	57	62	37	1,394,000
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	72	58	78	63	1,012,000
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	65	52	66	62	2,880,000
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	71	56	77	62	1,478,000
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	87	89	71	26	365,000
Wisconsin River (21 reservoirs) (PR)	76	83	69	8	399,000
MINNESOTA					
Mississippi River headwater system (FMR)	35	26	31	21	1,640,000
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	76	69	85	71	22,700,000
SOUTH DAKOTA					
Angostura (I)	63	73	85	62	127,600
Bell Fourche (I)	56	50	71	51	185,200
Lake Francis Case (FIP)	77	83	82	79	4,834,000
Lake Oahe (FIP)	81	72	.....	77	22,530,000
MIDCONTINENT REGION—Continued					
SOUTH DAKOTA—Continued					
Lake Sharpe (FIP)	99	99	100	99	1,725,000
Lewis and Clarke Lake (FIP)	78	79	82	78	477,000
NEBRASKA					
Lake McConaughy (IP)	83	84	78	82	1,948,000
OKLAHOMA					
Eufaula (FPR)	91	96	93	107	2,378,000
Keystone (FPR)	81	87	109	96	661,000
Tenkiller Ferry (FPR)	96	92	98	104	628,200
Lake Altus (FIMR)	19	22	57	18	133,000
Lake O'The Cherokees (FPR)	86	79	91	100	1,492,000
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	92	95	92	97	2,722,000
TEXAS					
Bridgeport (IMW)	100	34	48	100	386,400
Canyon (FMR)	93	99	77	93	385,600
International Amistad (FIMPW)	102	95	83	102	3,497,000
International Falcon (FIMPW)	87	99	70	94	2,668,000
Livingston (IMW)	101	98	85	103	1,788,000
Possum Kingdom (IMPRW)	87	92	96	88	570,200
Red Bluff (PI)	15	24	26	20	307,000
Toledo Bend (P)	100	83	89	93	4,472,000
Twin Buttes (FIM)	50	51	31	51	177,800
Lake Kemp (IMW)	57	52	85	60	268,000
Lake Meredith (FWM)	32	17	36	34	796,900
Lake Travis (FIMPRW)	94	99	80	96	1,144,000
THE WEST					
WASHINGTON					
Ross (PR)	24	65	27	30	1,052,000
Franklin D. Roosevelt Lake (IP)	4	55	48	31	5,022,000
Lake Chelan (PR)	28	61	39	30	676,100
Lake Cushman (PR)	97	88	88	87	359,500
Lake Merwin (P)	100	101	101	100	245,600
IDAHO					
Boise River (4 reservoirs) (FIP)	53	95	72	53	1,235,000
Coeur d'Alene Lake (P)	108	110	125	76	238,500
Pend Oreille Lake (FP)	61	73	57	61	1,561,000
IDAHO--WYOMING					
Upper Snake River (8 reservoirs) (MP)	58	92	75	68	4,401,000
WYOMING					
Boysen (FIP)	55	70	60	61	802,000
Buffalo Bill (IP)	45	77	61	49	421,300
Keyhole (F)	24	49	48	23	190,400
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	47	64	52	46	3,056,000
COLORADO					
John Martin (FIR)	11	17	14	14	364,400
Taylor Park (IR)	22	51	56	34	106,200
Colorado–Big Thompson project (I)	45	71	57	44	722,600
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	76	83	.....	76	31,620,000
UTAH--IDAHO					
Bear Lake (IPR)	71	75	63	67	1,421,000
CALIFORNIA					
Folsom (FIP)	81	93	73	76	1,000,000
Hetch Hetchy (MP)	62	46	37	52	360,400
Isabella (FIR)	61	46	31	36	568,100
Pine Flat (FI)	94	86	61	75	1,001,000
Clair Engle Lake (Lewiston) (P)	94	91	86	86	2,438,000
Lake Almanor (P)	104	84	58	102	1,036,000
Lake Berryessa (FIMW)	102	89	88	101	1,600,000
Millerton Lake (FI)	81	79	67	97	503,200
Shasta Lake (FIPR)	102	99	90	90	4,377,000
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	85	52	59	75	744,600
NEVADA					
Rye Patch (I)	59	76	71	50	194,300
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	87	87	66	89	27,970,000
ARIZONA					
San Carlos (IP)	24	52	22	26	1,073,000
Salt and Verde River system (IMPR)	86	73	52	83	2,073,000
NEW MEXICO					
Conchas (FIR)	41	31	79	46	330,100
Elephant Butte and Caballo (FIPR)	32	47	28	33	2,453,000

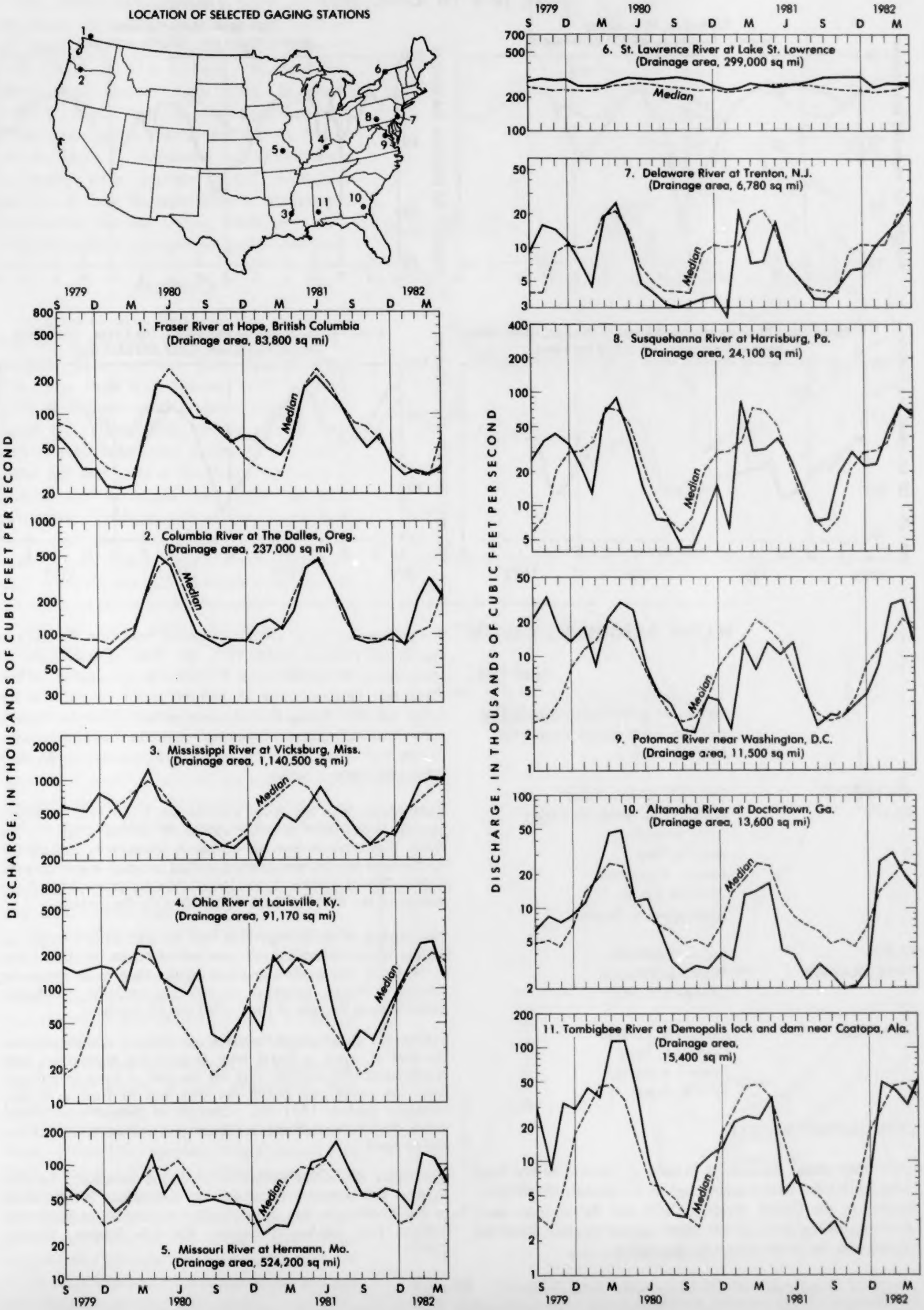
[a]1 acre-ft = 0.0436 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second day.
[b]Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

FLOW OF LARGE RIVERS DURING APRIL 1982

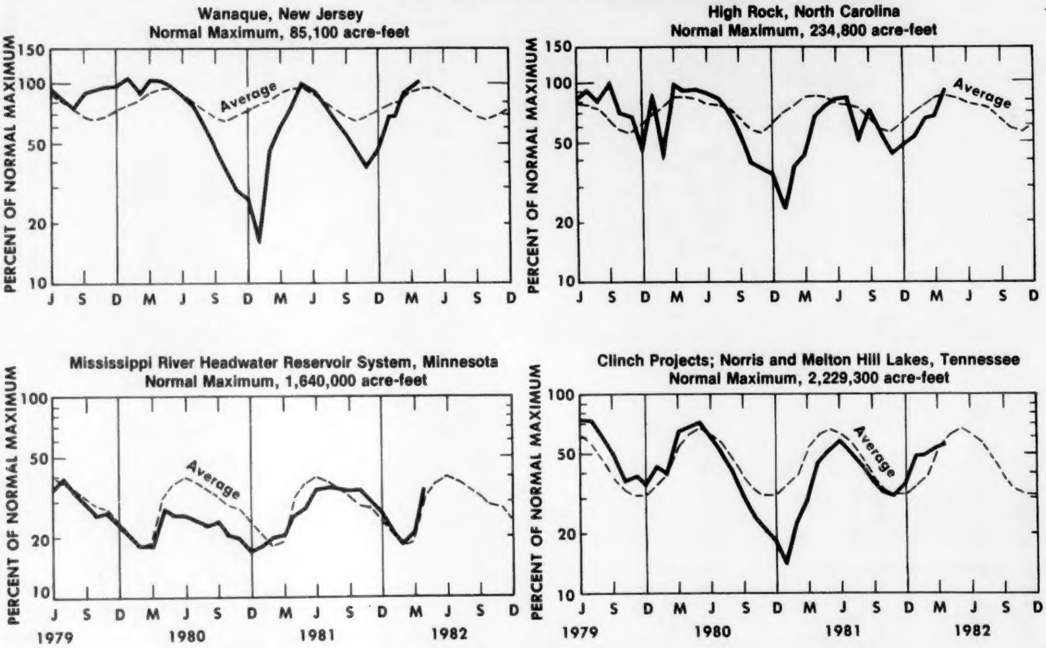
Station number	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1980 (cubic feet per second)	April 1982					
				Monthly mean discharge (cubic feet per second)	Percent of median monthly discharge, 1951–80	Change in discharge from pervious month (percent)	Discharge near end of month		
							Cubic feet per second	Million gallons per day	Date
01014000	St. John River below Fish River at Fort Kent, Maine	5,690	9,647	26,290	125	+1,245	88,000	56,900	30
01318500	Hudson River at Hadley, N.Y	1,664	2,909	11,400	127	+416	14,000	9,050	30
01357500	Mohawk River at Cohoes, N.Y	3,456	5,734	18,300	134	+76	13,000	8,400	30
01463500	Delaware River at Trenton, N.J	6,780	11,750	24,940	107	+50	24,800	16,000	29
01570500	Susquehanna River at Harrisburg, Pa	24,100	34,530	67,450	93	-15	28,900	18,700	30
01646500	Potomac River near Washington, D.C.	11,560	[1] 11,490	13,800	74	-53	16,200	10,500	30
02105500	Cape Fear River at William O. Huske Lock near Tarheel, N.C.	4,810	5,005	3,880	62	-63	14,200	9,180	30
02131000	Pee Dee River at Peedee, S.C	8,830	9,851	7,100	53	-56	18,000	11,600	30
02226000	Altamaha River at Doctortown, Ga	13,600	13,880	16,340	68	-16	15,000	9,700	27
02320500	Suwannee River at Branford, Fla	7,880	6,987	7,560	75	-6	7,380	4,770	30
02358000	Apalachicola River at Chattahoochee, Fla	17,200	22,570	27,900	84	+15	62,100	40,100	30
02467000	Tombigbee River at Demopolis lock and dam near Coatopa, Ala	15,400	23,300	52,180	108	+60	66,800	43,200	29
02489500	Pearl River near Bogalusa, La	6,630	9,768	10,865	62	-7	22,400	14,500	30
03049500	Allegheny River at Natrona, Pa	11,410	[1] 19,480	28,210	78	-36	10,000	6,460	26
03085000	Monongahela River at Braddock, Pa.	7,337	[1] 12,510	13,260	69	-56	4,550	2,940	26
03193000	Kanawha River at Kanawha Falls, W. Va	8,367	12,590	9,400	56	-64	5,050	3,260	26
03234500	Scioto River at Higby, Ohio	5,131	4,547	5,345	72	-57	1,970	1,270	26
03294500	Ohio River at Louisville, Ky[2]	91,170	116,000	135,000	65	-48	61,000	39,400	27
03377500	Wabash River at Mount Carmel, Ill	28,635	27,220	64,070	127	-40	41,000	26,500	30
03469000	French Broad River below Douglas Dam, Tenn	4,543	6,798	5,442	48	-49	......	......	....
04084500	Fox River at Rapide Croche Dam, near Wrightstown, Wis[2]	6,150	4,163	2,895	42	-6	3,466	2,240	27
04264331	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y[3]	299,000	242,700	276,300	104	+9	281,000	182,000	30
050115	St. Maurice River at Grand Mere, Quebec	16,300	25,150	19,000	43	+267	54,000	34,900	30
05082500	Red River of the North at Grand Forks, N. Dak	30,100	2,551	17,780	201	+708	7,400	4,800	30
05133500	Rainy River at Manitou Rapids, Minn.	19,400	12,830	17,300	103	+88	29,500	19,100	26
05330000	Minnesota River near Jordan, Minn.	16,200	3,402	13,013	185	+63	9,800	6,300	30
05331000	Mississippi River at St. Paul, Minn	36,800	[1] 10,610	48,720	198	+242	43,300	28,000	30
05365500	Chippewa River at Chippewa Falls, Wis	5,600	5,100	22,214	214	+501	......	......	....
05407000	Wisconsin River at Muscoda, Wis	10,300	8,617	23,226	148	+150	......	......	....
05446500	Rock River near Joslin, Ill	9,551	5,873	17,500	173	+1	10,000	6,460	30
05474500	Mississippi River at Keokuk, Iowa	119,000	62,620	176,500	137	+42	191,000	123,000	30
06214500	Yellowstone River at Billings, Mont	11,796	7,038	3,706	93	+35	5,120	3,310	30
06934500	Missouri River at Hermann, Mo	524,200	79,490	73,100	83	-35	53,000	34,300	29
07289000	Mississippi River at Vicksburg, Miss[4]	1,140,500	576,600	1,003,900	110	-3	839,000	542,000	26
07331000	Washita River near Dickson, Okla.	7,202	1,368	370	40	-54	290	190	30
08276500	Rio Grande below Taos Junction Bridge, near Taos, N. Mex	9,730	725	582	112	+4	530	340	30
09315000	Green River at Green River, Utah.	40,600	6,298	5,977	112	+28	8,140	5,260	22
11425500	Sacramento River at Verona, Calif	21,257	18,820	64,580	330	+17	48,100	31,100	30
13269000	Snake River at Weiser, Idaho	69,200	18,050	47,494	217	+39	48,080	31,070	26
13317000	Salmon River at White Bird, Idaho	13,550	11,250	11,557	113	-66	19,400	12,500	27
13342500	Clearwater River at Spalding, Idaho	9,570	15,480	25,425	88	+12	28,380	18,340	27
14105700	Columbia River at The Dalles, Oreg[5]	237,000	193,100	210,500	96	-33	......	......	....
14191000	Willamette River at Salem, Oreg.	7,280	23,510	38,400	133	+8	25,200	16,300	26-30
15515500	Tanana River at Nenana, Alaska.	25,600	23,460	6,733	84	+9	74,000	48,000	26
8MF005	Fraser River at Hope, British Columbia	83,800	96,290	34,990	58	+19	70,620	45,640	30

[1] Adjusted.
[2] Records furnished by Corps of Engineers.
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

HYDROGRAPHS OF SOME LARGE RIVERS, SEPTEMBER 1979 TO APRIL 1982



USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS, JUNE 1979 TO APRIL 1982



WATER RESOURCES REVIEW

April 1982

Based on reports from the Canadian and U.S. Field offices; completed May 12, 1982

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EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for April based on 18 index stream-gaging stations in Canada and 164 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for April 1982 is compared with flow for April in the 30-year reference period 1951–80. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for April is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being *within the normal range.* In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the April flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of April. Water level in each key observation well is compared with average level for the end of April determined from the entire past record for that well or from a 30-year reference period, 1951–80. *Changes in ground-water levels,* unless described otherwise, are from the end of March to the end of April.

The Water Resources Review is published monthly. Special-purpose and summary issues are also published. Subscriptions to the Review are free on application to the Water Resources Review, U.S. Geological Survey, MS 420, Reston, Virginia 22092.

SOURCE AREAS OF SALINITY AND TRENDS OF SALT LOADS IN STREAMFLOW IN THE UPPER COLORADO RIVER, TEXAS

The abstract and illustrations below are from the report, *Source areas of salinity and trends of salt loads in streamflow in the Upper Colorado River, Texas,* by Jack Rawson, U.S. Geological Survey Water Supply Paper 2084, 36 pages, 2 plates, 1982. This report may be purchased for $3.00 from Eastern Distribution Branch, USGS, 604 S. Pickett St., Alexandria, VA 22304 (check or money order payable to U.S. Geological Survey); or from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 (payable to Superintendent of Documents).

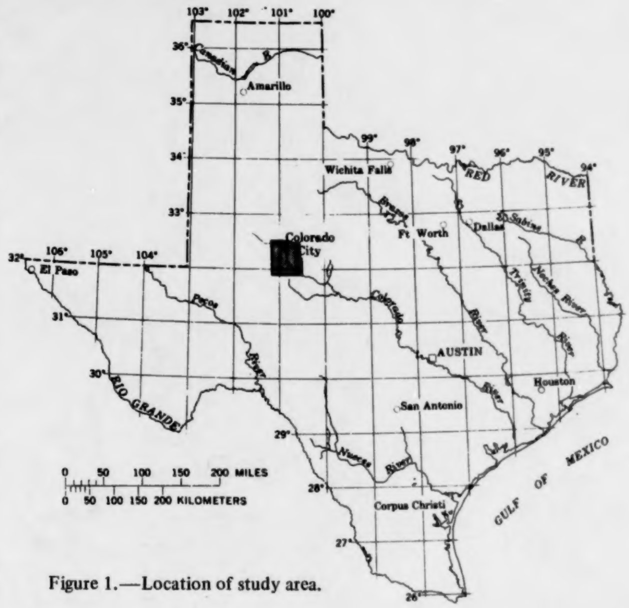

Figure 1.—Location of study area.

ABSTRACT

A series of seven studies of the quality and quantity of low flows in a 35.5-mile reach of the Colorado River upstream from Colorado City, Tex., were made from February 1975 to March 1978 to delineate areas of saline inflows. (See figure 1.) These studies showed generally that ground water contributed throughout the reach is saline but that loads of dissolved constituents in ground-water accretions are highest in three subreaches. Yields per mile of river channel from these subreaches during the low-flow studies averaged more than 5.5 tons of dissolved solids per day, of which more than 1.8 tons were sodium and 2.9 tons were chloride. (See figure 2.)

Salt-load trend studies for three long-term continuous streamflow and daily water quality stations show that the salinity of the flow upstream from Ira, Tex., (mile 826.3) increased significantly after 1963 but decreased significantly after 1970. Part of the reach upstream from Ira is proximate to oil fields. The production and open-pit disposal of oil-field brines in the area increased significantly in the early 1960's, but a ban on open-pit disposal was enacted in 1969. No significantly downward trend in the salinity of flow at other daily water-quality stations downstream from Ira occurred after the ban on open-pit disposal of oil-field brines.

The low-flow and salt-load trend studies indicate that part of the salinity in the flow of the Colorado River has resulted from the inflow of oil-field brine, but preponderant evidence indicates that the major part of the salinity is of natural origin. Neither the ban on open-pit disposal nor pumping of saline ground water has significantly reduced the salinity of flow downstream from Cuthbert, Tex. (mile 810.6).

Diversion of saline low flows from the Colorado River at mile 799.3 upstream from Colorado City since January 1969 has resulted in significant improvement in the quality of water. Decreases in the discharge-weighted averages of dissolved solids and of chloride in the flow of the Colorado River at Colorado City (mile 796.3) during the 1969–78 water years were about 420 milligrams per liter and 280 milligrams per liter, respectively.

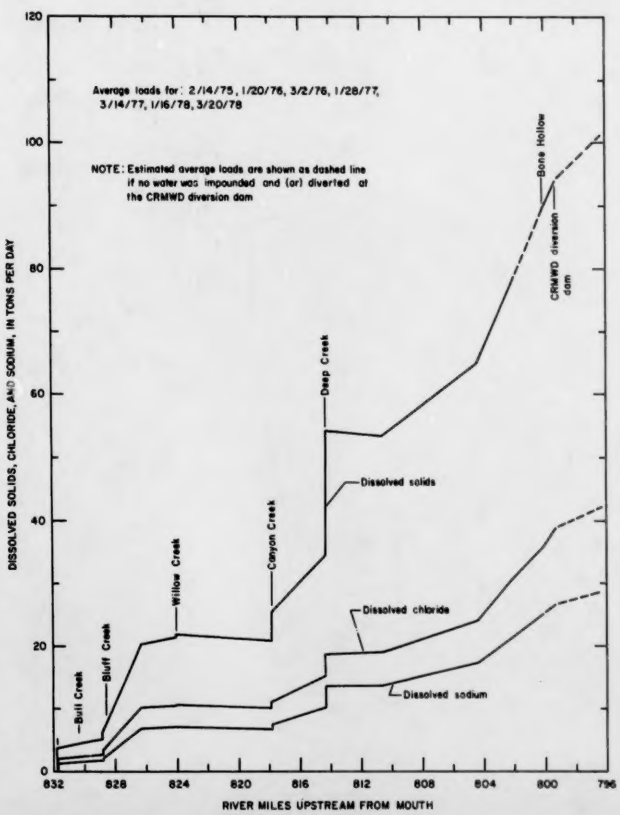

Figure 2.—Dissolved-solids, sodium, and chloride loads for the Colorado River during selected low-flow periods from February 1975 to March 1978.

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